Enhancing Professionalism in Construction Project Controls

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Demand is high for construction project and program controls employees. People of varied academic backgrounds can find themselves at project controls (PC) desks. Construction PC provides budget and schedule control information for proactive program and project management. Some academic preparations would seem to be better than others for those working in PC. Graduates of typical construction oriented programs of instruction are well prepared to seek a career in PC, whether in engineering or construction organizations. Application of educational resources and other interaction with the membership of an appropriate professional organization can directly and meaningfully assist students and faculty members in this specialized education effort.

Key Words: Project Controls; Cost Engineering; Professional Development; Professional Associations

Introduction

The generally acceptable economic conditions that now prevail in much of the developed world increase the demand for design and construction, and that increases the demand for project controls professionals. Although some disciplines might only be needed for various phases of the project, PC professionals can be involved with projects from concept to final closeout: time and money are closely managed throughout a project's duration. Also, with modern data transmission, they can often perform their jobs from one office location without moving their residence after completing projects they work on. For example, project superintendents, quality control professionals, and safety managers must spend a good deal of time on site to properly perform their duties; but controllers often work from half a world away, maybe supplementing their distant attention with a few site visits. These conditions offer PC professionals somewhat more stability in their lives than many engineering or construction professionals normally experience. Entry to project controls work thus merits the attention of construction students and the faculty members who prepare them for their profession. Gaining familiarity with the services offered by professional associations with keen interest in project controls can be useful for construction faculty members and their students.

Defining Project Controls

Project controls might mean different things to different people. Author observations of positions staffed in program or project controls departments of major contractors leads him to conclude that construction PC includes the disciplines of cost estimating, scheduling, and cost control. Also included within the PC function is documentation and control of events that result in budget or schedule changes—change management. The activities of the individual disciplines must be integrated and coordinated to give decision-makers a current and complete view of

budget and schedule impacts of ongoing project activities. Ideally, effective project controls should enable managers to forecast budget overruns or schedule delays soon enough that remedial action might be possible to bring the project within budget or schedule.

The Construction Management Association of America states that project control ". . . services are provided to ensure that the project is efficiently and effectively managed. They include maintenance of project correspondence, conducting progress meetings, handling submittals and requests for information, documentation of progress, review of pay requests, schedule reviews and schedule updates. . ." (CMAA, 2008).

In a somewhat different vein, the Association for Advancement of Cost Engineering International (AACE) has recently defined project controls to be "A management process for controlling the investment of resources in an asset where investments are made through the execution of a project. Project control includes the steps of: (1) Project planning including establishing project cost and schedule baselines; (2) Measuring project performance; (3) Comparing measurement against the project plans; and (4) Taking corrective, mitigating, or improvement action as may be determined through forecasting and further planning activity" (AACE, 2007). The American National Standards Institute (ANSI) publishes definitions from AACE's Recommended Practice 10S-90, Standard Cost Engineering Terminology (1990), which includes project controls-specific definitions, in the ANSI Z94.4 standard, Cost Engineering and Project Management (ANSI, 1998).

With current high demand for construction project controllers, compensation is good. A 2006 salary survey including 371 project controls professionals revealed an average PC salary of $92,093, an increase of 10.4 percent from 2005 (AACE, 2007). Not all of the respondents were supervisors or senior staff. More than 25 percent of responding project controllers had fewer than 10 years of job-related experience, and 38 percent carried no supervisory duties. Due to the demand and compensation, it is not unusual to see procurement, finance, or even field specialists try their hands in project controls positions. After that, if they prove themselves, opportunities for advancement are excellent, whether one remains in PC-specific positions or seeks other responsibilities. PC knowledge is useful for construction professionals in any type of position, especially project management. Common schemes of advancement for project controllers include those shown in figure 1 (Hannon, 2007). It is instructive to note the complementarity of professional association opportunities for lifelong learning and service, in the right column, as professionals advance in their careers.

Success in PC positions requires many of the same skills and competencies that are needed in other construction professional jobs (AACE, 2007). College-level mathematical skills should be reliable and include competence in elementary statistics, which is essential for better analysis and aids understanding of risk. Verbal communication, both oral and written, should be accurate. A disciplined team perspective is essential. Seldom is an accurate picture of project status determined by one person, especially when major decisions are at hand. A good PC professional has the ability to remain focused on accurate performance of repetitive detailed tasks, but they can synthesize a bigger picture of events from detailed and sometimes incomplete project information. That is, a good PC professional requires mental flexibility, which often develops from a good baccalaureate education.

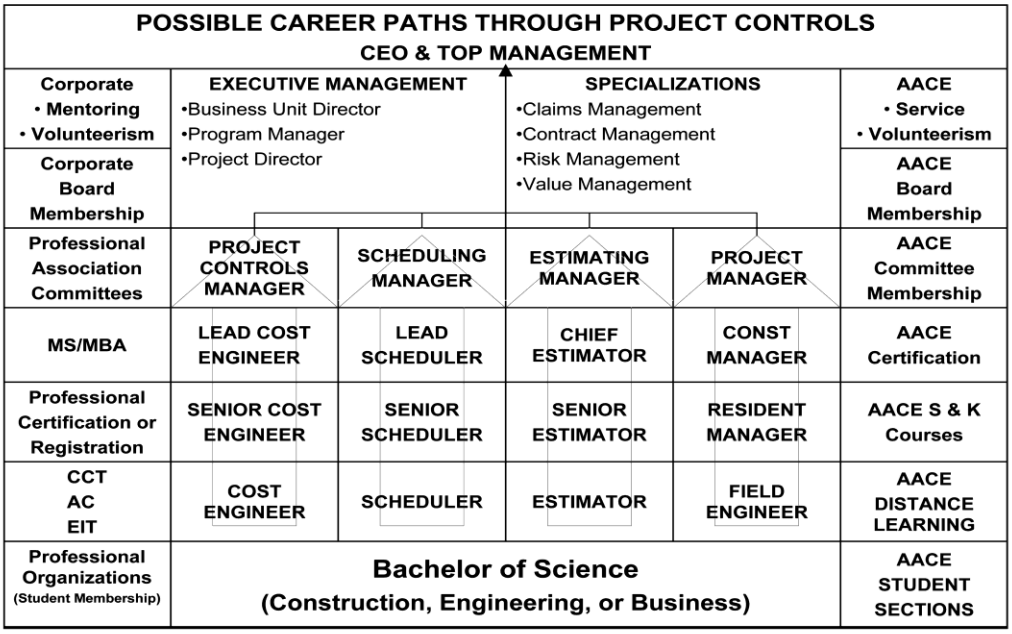

Figure 1: Possible career advancement for project controls and project management professionals. Professional education, certification, and service opportunities are depicted in the flanking columns. Professional job disciplines and possible progressions are depicted in the middle columns.

Educating Project Controllers

The kind of education that best prepares the young professional for PC work might vary; good project controllers come from many educational backgrounds. But one can make a strong argument that a construction management, construction science, construction technology, or construction engineering degree—from any program that meets American Council of Construction Education (ACCE) or Accreditation Board for Engineering and Technology (ABET) accreditation criteria—is almost ideal preparation for typical project control responsibilities. This does not mean that the relevance of some other degrees, such as business or engineering, should be ignored as inappropriate for project controls. However, construction graduates enter the PC arena with a solid background in the theory that enables them to more readily grasp the "what and why" of controls activities.

For example, the ACCE baccalaureate Curriculum Categories comprise 20 semester-hours of Construction coursework. Suggested courses in Construction include project controls sub-topics of estimating, manpower estimates, work analysis, scheduling, project budgeting, cost control, and cash flow (ACCE, 2006). Formal construction education is especially useful for the junior PC professional, but the individual should get a year or so of construction field experience under

their belt. Then the numbers they analyze in the office will mean more to them in a practical sense, and they should be able to perform their jobs better. Due to better understanding of the nature of the work processes on site, estimating, scheduling, and cost control should be better with an ASC-educated man or woman performing a controls action than somebody less educated in construction subjects.

Because higher construction education typically teaches students elements of introductory estimating and scheduling, two of the three primary disciplines of project controls are normally introduced in accredited programs of instruction. The cost control discipline, on the other hand, might be less likely to have a devoted course or series of devoted cost control lessons. Construction accounting courses are not uncommon, but construction accounting alone is less than ideal as a construction cost control course. Accounting procedures, which are tailored more to the needs of business owners and government and not to project managers, are usually completed too late to provide the project with information for timely action to prevent overspending the budget. That is, accounting can be viewed as the capture of history, but project cost control requires that one accurately forecast the future based on the most recent data reported from the field, so that budget overruns can be prevented. A major concern for cost-reimbursable contracts is recurrently forecasting a reliable project cost estimate at completion (EAC) for the owner. Another important task that might be required of some PC departments is cash flow forecasting. That subject deserves attention, too.

There may be a number of ways to address the cost control instruction requirement, but the financial and cost control weekly topic sequence that follows (see table 1) was applied successfully in a quarter-long, 3.0-hour course (MSOE, 2004). Junior construction management students had completed prerequisites in cost estimating, business accounting, and business finance; most were taking construction scheduling concurrently with the cost control course. The first half of the course exposed them to construction-specific accounting topics, as many construction programs do, but the second half of the course moved them into construction cost forecasting and control topics. A construction accountant taught the first half of the course, and a construction cost engineer delivered the second half. Students were required to integrate the more general cost-related knowledge that the business courses provided and apply it to the specifics of typical construction project actions. Discussions also drew upon ongoing learning about construction scheduling and its impact on matters of cost and cash flow.

Integrated into many of the lessons was an explanation of what might be happening in the field to lead to the conditions that would generate the trends in numbers reported to the office. The effective PC professional understands and confirms such implications, especially so that corrective actions, if required, can be implemented soonest.

Included in the cost control course is an introduction to the Earned Value Management System (EVMS), which is one of the best practices for construction project controls (Venters, Warhoe, & Candela, 2005). The system integrates program scope with schedule and cost elements to offer a better-integrated picture of program or project status. Not all projects can justify management by earned value, since proper application of the complete system adds to project overhead costs. EVMS application tends to be discouraged on lump-sum, level-of-effort, and time-and-materials contracts. Some agencies of the U.S. Government, which can be less constrained by economics

than the private sector, demand application of EVMS for cost or incentive contracts valued at or over $20 million. EVMSs that are fully validated by federal contracting officers must be implemented for cost or incentive projects valued at more than $50 million (DSMC, 2006). Validation in those cases is performed by ensuring substantial compliance with 32 guidelines defined in ANSI/EIA 748-A Earned Value Management Systems (NDIA-PMSC, 2006). For smaller private-sector work, management by earned value will likely remain uncommon. For constructors on larger federal or other cost-reimbursable public works, EVMS is probably here to stay.

Table 1

Viable financial and cost control weekly topic sequence for a quarter-long course of 3.0 lecture-hours

Week	Topics
1	Introduction to Financial Accounting Systems; Debits and Credits (w/ Quiz); Accounting Theory w/ Emphasis on Construction
2	Principles of Job Cost Accounting; Introduction to Case Study
3	Review Case Study Homework; Reconcile Accounts & Change Orders
4	Percentage of Completion Exam; Report Preparation (Balance Sheet, Statement of Earnings, Job Status, Percentage of Completion Schedule, Statement of Cash Flows)
5	Analyzing and Reading Financial Reports and Ratios; Work Breakdown Structure; More about Change Orders; Advanced Topics: Justification of Safety Cost, Insurance, and Construction Claims
6	Elementary Mathematical Forecasting Techniques; Theory of Organizational and Operational Control; Management Information Systems for Project Control
7	Status Reports and Analysis; Intro to EVMS
8	Cash Flow Analysis
9	Controlling Labor; Controlling Materials; Case Study Introduction
10	Controlling Equipment; Controlling Changes; Theory of Decision-making and Implementation
11	Final Examination (comprehensive)

Learning more about project controls theory and practices might not be difficult for professionals who work in larger organizations with ample PC functional hierarchies. Many who can and should seek enhanced controls-related knowledge, skills, and abilities do not have that opportunity. That causes those dedicated, improvement-seeking PC professionals to look outside their own, more limited organizations for professional development. Interaction with a relevant professional organization might offer the best chance for a project controls professional to enhance their skills and knowledge.

Project Controls Educational Resources Available from a Professional Association

The array of professional associations that are useful for construction educators and students seems to grow every year. Locating an organization that emphasizes professional development for and learning about a given construction subject is not difficult. A recent search of the worldwide web, initially on the words “professional association construction project controls,” revealed one industry association that appears to broadly and deeply address matters of educational significance in construction project controls. That search confirmed what the author found to be true while in higher education from 1995-2005. While some other associations encompass a subset of the controls activities mentioned earlier, and although they are effective at

what they do, only one was discovered to publish a sizeable array of technical reference documents about construction project controls activities. For project controllers and those who would teach or learn more about PC matters, resources available from AACE International (AACE) merit close examination.

Publications

As an example of resources developed in large measure for project controllers, an array of publications from AACE provides faculty and students with reference to techniques that have the consensus of many construction industry practitioners among owners, designers, and builders. The abstracts of an extensive Virtual Library are available for access by anyone on the AACE web site. The library is a great repository of project controls and management knowledge, which has been published over the decades in the Cost Engineering journal and the annual Transactions. Few discount the importance of theory in construction education, but the practical objective of such education requires that theory be leavened with relevant examples of practical experience, if the greatest learning is to be imparted. Students need to know details about the application of management skills and technical abilities that have been found useful within the framework of theory. Many of the AACE publications in the Virtual Library and elsewhere offer such a benefit.

The Total Cost Management (TCM) Framework was published after many years of discussion, synthesis, and compilation (Hollman, 2006). It provides a coherent way of viewing in great detail the interacting processes and activities by which business assets are developed and managed. Project control and other construction processes and necessary competencies lie within that framework. It might also be of special value to construction faculty members seeking to develop a well-integrated and complete program of instruction. It enables them to ensure that they are "covering the skills and knowledge bases," as an array of seasoned practitioners and educators discern and structure the essential professional capabilities.

AACE publishes Recommended Practices (RPs) for subject matter spanning many project controls activities and concerns. These practices are periodically updated to hold the current consensus of a wide array of industry practitioners. As such, they offer educators excellent material from which to draw for relevant, up-to-date, widely applicable instruction. Individual construction firms perform some processes differently from each other. It can be argued that higher education better prepares its graduates for the array of challenges they will meet, if they are more broadly educated and not taught only how "Company X" specifically does business. If so, the RPs enable educators to accurately generalize their course material.

Professional Practice Guides (PPGs) are structured compilations of Cost Engineering journal and Transactions articles and RPs whose subjects are comprised in the PPG topic. They afford wide-ranging insight into the professional practices associated with the PPG title. That is, they are not larded with theory, but they show the reader an array of typical industry techniques for implementing effective management and technical mechanisms needed to accomplish work in the PPG subject.

Certifications

The value of professional certification need not be touted to the many Certified Professional Constructors (CPCs) of ASC member programs. An earned knowledge-based or competency-based certification for a discipline enhances professionalism by establishing standards of performance in the discipline. Since 1976 AACE has offered certification of cost engineering skills—a formal and objective confirmation of the individual's knowledge, skill, and ability to perform cost engineering functions with professional accuracy, reliability, and speed. Global employment opportunities appear to increase professionals' demands for certifications by which to objectively prove their ability to accomplish their jobs. The opportunity or necessity for mobility enhances the value of a well-respected professional credential. Many successful construction practitioners understand the value of relevant certifications, and that a wider array of certifications is needed to further professionalize project controls. Under the leadership of successful construction industry practitioners and educators, assorted professional associations including AACE have moved to address this need. Thus, in addition to the credential for Certified Cost Engineers (CCE, only for those with engineering degrees) and Certified Cost Consultants (CCC, same requirements but for those with non-engineering degrees), other certifications that further professionalize project controls now include:

- Certified Cost Technician (CCT, an optional early step to CCE or CCC).
- Planning and Scheduling Professional (PSP).
- Earned Value Professional (EVP).
- Certified Forensic Claims Consultant (CFCC).

Another certification, Certified Estimating Professional (CEP), is under development as this paper is written. A reciprocity agreement between AACE and the Royal Institution of Chartered Surveyors (RICS) increases the value of participation with either of those associations. Project controllers who socialize with either might thereby benefit from broader perspectives.

Members and Sections

Besides the international organization and its major events, many local sections--mostly in the U.S. and Canada, but others throughout the world--offer occasion for frequent, routine interaction and networking with other total cost and management professionals. The membership, over 6,000 by the end of 2007, comprises a wonderful array of highly skilled specialists and managers, many of whom are devoted to enhancement of construction cost engineering education. It requires little imagination to see how attending the meetings can boost professional development, whether one is an AACE member or not.

There are about 80 international sections comprising members from more than 75 nations. A number of sections compile presentations and offer seminars about Total Cost Management subjects, which they make available to the local professional and educational community. These often enable attendees to earn continuing education units (CEUs). Local AACE sections can be a good source of adjunct faculty members for courses, guest speakers for professional events, and hosts for professional tours. Leavening of a construction program's instruction about PC with practitioner perspectives makes learning more useful and relevant.

Faculty members and students can publish peer-reviewed papers and make presentations at local and annual meetings. Networking opportunities with other project controllers abound at meetings. If a faculty member interested in PC wants more involvement than local section activities permit, there are frequent opportunities for professional service on the international Technical, Education, and Certification Boards. The international technical committees and special interest groups (SIGs) sometimes need chairs and always welcome new members. Progressive service such as this complements the construction project control professional's career advancement, and leadership in a relevant association might well draw positive attention to the constructor's potential for increased job responsibility.

Scholarships

One of the greatest services any professional association provides the higher educational community is student scholarships. Since the 1960s AACE has competitively awarded scholarships exceeding a total of $1 million at section and international levels to deserving students of cost engineering—many of them in construction programs (Evans, 2007). Applications are available on the AACE web site and from local section leaders. Those AACE members associated with the scholarship program are sometimes surprised at the relatively low numbers of applicants for the significant funds available. Deadlines for scholarship submittals each year have been rescheduled to December, thus offering students more time after the school year begins to prepare their applications. More applicants mean more students who are exposed to cost engineering, in general, and the opportunities in project controls, in particular. Project controls professionalism is eventually enhanced thereby.

Conclusion

The preceding discussion explains construction project controls in the context of what it is; how it might be taught; and an example of a professional association offering resources that can enhance education and professional performance in project controls. Many of the organization's activities develop project controls practices to make them more useful to the construction industry and construction educators. Associated Schools of Construction programs can have a significant effect on the awareness of young constructors about the rewards of the project controls discipline. As ASC programs prepare their students for construction project controls and other professional positions in the construction industry, associations such as AACE stand ready to assist those efforts. One expects that faculty and students in higher construction education might further avail themselves of the value such associations can deliver.

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